AMENDMENTS TO THE CLAIMS:

The listing of claims will replace all prior versions, and listings of claims in the application:

LISTING OF THE CLAIMS

1. (Currently Amended) A photolytic apparatus for oxygenating and removing carbon dioxide from a confined volume area comprising:

a photolytic cell having an anode compartment with an anode with a photo-active surface having the ability to convert water to oxygen; and, a cathode compartment with a cathode, having the ability to convert carbon dioxide and hydrogen ion to a solid or liquid medium, said cathode being connected to the anode; and

a light source for providing light photons to said photolytic cell and activating the photo-reactive surface.

2. (Original) The apparatus of claim 1, wherein said photo-reactive surface comprises a light-activated catalyst.

3. (Original) The apparatus of claim 2, wherein said light activated catalyst is a metal oxide catalyst comprising anatase (TiO_2), WO_3 or ZnO, combinations thereof, with or without performance enhancing dopants.

4. (Original) The apparatus of claim 1, wherein said light source is an ultraviolet light at 350-500 nm.

5. (Original) The apparatus of claim 2, wherein said light-activated catalyst converts, when photolytically irradiated, water to hydrogen ions, electrons and active oxygen.

6. (Original) The apparatus of claim 5, wherein said active oxygen formed during photolysis is hydrogen peroxide or other forms of oxygen gas precursors.

7. (Original) The apparatus of claim 5, wherein said electrons generated during photolysis are then electrically conducted away to avoid reversal of the reaction.

8. (Original) The apparatus of claim 5, wherein said active oxygen formed during photolysis is converted by a disproportionation catalyst into dissolved oxygen.

9. (Original) The apparatus of claim 8, wherein said disproportionation catalyst is MnO_2.

10. (Currently Amended) The apparatus of claim 1, wherein the carbon dioxide and hydrogen ion are converted to a carbonate solid.

11. (Currently Amended) The apparatus of claim 1, wherein the hydrogen ion is reacted with a substrate to produce a non-gaseous substance.

12. (Original) The apparatus of claim 11, wherein the substrate is an electrochemically reducible compound.

13. (Original) The apparatus of claim 1, wherein the photo-reactive surface comprises a light transparent substrate and a photolytic coating.

14. (Original) The apparatus of claim 13, wherein said photolytic coating comprises a layer of a light activated catalyst which converts, when photolytically irradiated, water to hydrogen ions, electrons and active oxygen.

15. (Original) The apparatus of claim 14, wherein said photolytic coating further comprises a disproportionation catalyst which converts active oxygen to dissolved oxygen.

16. (Original) The apparatus of claim 1, wherein the anode compartment and the cathode compartment are separated by a membrane.

17. (Original) The apparatus of claim 16, wherein said membrane allows for the flow of hydrogen ions from the anode compartment to the cathode compartment.

18. (Original) The apparatus of claim 1, wherein the photolytic cell comprises a mesoporous material.

19. (Currently Amended) A photolytic apparatus for oxygenating and removing carbon dioxide and hydrogen gas in order to maintain a proper physiological environment comprising:

a photolytic cell having an anode compartment and a cathode compartment, a) said anode compartment having an inlet for receiving an aqueous solution, an anode conductor, a photo-reactive surface, and an outlet for transporting a dissolved oxygenated solution out of said anode compartment, wherein said photo-reactive surface has the ability, upon photo-activation, to convert water in an aqueous solution to dissolved oxygen, hydrogen ions and electrons upon light activation; b) said cathode compartment having an inlet for receiving carbon dioxide, C_5 pentose, and a catalyst, a cathode conductor for converting hydrogen ions, carbon dioxide, C_5 pentose and catalyst to C_6 ~~pentose~~hexose, and an outlet for removing the C_6 ~~pentose~~ hexose from the cell and any remaining reactants, wherein said cathode conductor is connected to said anode conductor; and,

a light source for providing light photons to said photo-reactive surface to initiate a series of chemical reactions that results in dissolved oxygen generation in the anode compartment and C_6 ~~pentose~~ hexose formation in the cathode compartment.

20. (Original) The apparatus of claim 19, wherein said light photo-reactive surface comprises a layer of a light activated photolytic catalyst.

21. (Original) The apparatus of claim 20, wherein said light activated photolytic catalyst is a metal oxide comprises TiO_2 (anatase), WO_3 or ZnO, or combination thereof.

22. (Original) The apparatus of claim 19, wherein said light source is an ultraviolet light at 350-500 nm.

23. (Original) The apparatus of claim 19, wherein said photo-reactive surface further comprises a disproportionation catalyst.

24. (Original) The apparatus of claim 19, wherein said photolytic cell comprises a transparent substrate and a photolytic coating comprising a first disposed layer of TiO_2 (anatase) and a second disposed layer of MnO_2.

25. (Original) The apparatus of claim 19, wherein said cell is constructed from mesoporous materials.

26. (Original) The apparatus of claim 23, wherein said disproportionation catalyst includes at least one of Fe^{II}, Fe^{III}, Cu^{I}, Cu^{II}, $Co^{I}I$, Co^{II}, Mn^{II}, Mn^{III}, Mn^{IV}, and MnO_2.

27. (Original) The apparatus of claim 26, wherein said catalyst is MnO_2.

28. (Original) The apparatus of claim 20, wherein said light-activated photolytic catalyst converts water into active oxygen.

29. (Original) The apparatus of claim 26, wherein said disproportionation catalyst converts active oxygen to dissolved oxygen.

30. (Original) The apparatus of claim 26, wherein said cell is constructed from mesoporous materials.

31. (Currently Amended) The apparatus of claim 26, wherein said cell is constructed of self-assembled monolayers on mesoporous supports~~SAMMS~~.

32. (Original) The apparatus of claim 19, wherein the anode compartment and the cathode compartment are separated by a cationic membrane.

33. (New) The apparatus of claim 1, wherein the carbon dioxide and hydrogen ion are converted to an inorganic or organic carbon based compound.

34. (New) A photolytic apparatus for oxygenating and removing carbon dioxide and hydrogen gas in order to maintain a physiological environment comprising:

a photolytic cell having an anode compartment and a cathode compartment,

a) said anode compartment having an inlet for receiving an aqueous solution, an anode conductor, a photo-reactive surface, and an outlet for transporting a dissolved oxygenated solution out of said anode compartment, wherein said photo-reactive surface has the ability, upon photo-activation, to convert water in an aqueous solution to dissolved oxygen, hydrogen ions and electrons upon light activation;

b) said cathode compartment having an inlet for receiving carbon dioxide, C_5 pentose, and a catalyst, a cathode conductor for converting hydrogen ions, carbon dioxide, to higher carbon compositions, and an outlet for removing the C_6 hexose from the cell and any remaining reactants , wherein said cathode conductor is connected to said anode conductor; and

a light source for providing light photons to said photo-reactive surface to initiate a series of chemical reactions that results in dissolved oxygen generation in the anode compartment and C_6 hexose formation in the cathode compartment.